



Analytical Laboratory

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Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: J13110456

Project Name: WWTS FGD-Routine 2013

Customer Name(s): Bill K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: _____ **Date:** 12/19/2013
(Signature) Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013028761	BELEWS	26-Nov-13 11:30 AM	Tim Owens	FGD Purge Eff
2013028762	BELEWS	26-Nov-13 11:35 AM	Tim Owens	EQ Tank Eff
2013028763	BELEWS	26-Nov-13 11:40 AM	Tim Owens	BioReactor 1 Inf
2013028764	BELEWS	26-Nov-13 11:45 AM	Tim Owens	BioReactor 2 Inf
2013028765	BELEWS	26-Nov-13 11:50 AM	Tim Owens	BioReactor 2 Eff
2013028766	BELEWS	26-Nov-13 12:00 PM	Tim Owens	Filter Blk
2013028767	BELEWS	22-Nov-13		TRIP BLANK
7 Total Samples				

Technical Validation Review

Checklist:

- | | | |
|--|---|--|
| COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures). | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| All Results are less than the laboratory reporting limits. | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| All laboratory QA/QC requirements are acceptable. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

Report Sections Included:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Job Summary Report | <input checked="" type="checkbox"/> Sub-contracted Laboratory Results |
| <input checked="" type="checkbox"/> Sample Identification | <input type="checkbox"/> Customer Specific Data Sheets, Reports, & Documentation |
| <input checked="" type="checkbox"/> Technical Validation of Data Package | <input type="checkbox"/> Customer Database Entries |
| <input checked="" type="checkbox"/> Analytical Laboratory Certificate of Analysis | <input checked="" type="checkbox"/> Chain of Custody |
| <input type="checkbox"/> Analytical Laboratory QC Report | <input checked="" type="checkbox"/> Electronic Data Deliverable (EDD) Sent Separatel |

Reviewed By: DBA Account

Date: 12/19/2013

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110456**

Site: FGD Purge Eff

Collection Date: 26-Nov-13 11:30 AM

Sample #: 2013028761

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	4.1	mg-N/L		0.25	25	EPA 353.2	12/05/2013 13:58	TLINN
<u>INORGANIC IONS BY IC</u>								
Bromide	110	mg/L		5	50	EPA 300.0	12/02/2013 22:57	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	21.0	ug/L		5	100	EPA 245.1	12/06/2013 12:22	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	198	mg/L		0.5	10	EPA 200.7	12/04/2013 10:51	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/10/2013 13:37	DJSULL1
Selenium (Se)	143	ug/L		10	10	EPA 200.8	12/10/2013 13:37	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	40.0	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Chromium (Cr)	46.3	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Copper (Cu)	26.0	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Nickel (Ni)	154	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Selenium (Se)	511	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
Zinc (Zn)	89.2	ug/L		10	10	EPA 200.8	12/09/2013 11:42	DJSULL1
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Site: EQ Tank Eff

Collection Date: 26-Nov-13 11:35 AM

Sample #: 2013028762

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	22.4	ug/L		2.5	50	EPA 245.1	12/06/2013 12:34	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	198	mg/L		0.5	10	EPA 200.7	12/04/2013 10:56	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/10/2013 13:40	DJSULL1
Selenium (Se)	88.3	ug/L		10	10	EPA 200.8	12/10/2013 13:40	DJSULL1

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110456**

Site: EQ Tank Eff

Collection Date: 26-Nov-13 11:35 AM

Sample #: 2013028762

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	46.1	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Chromium (Cr)	57.1	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Copper (Cu)	31.8	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Nickel (Ni)	143	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Selenium (Se)	538	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1
Zinc (Zn)	83.9	ug/L		10	10	EPA 200.8	12/09/2013 11:45	DJSULL1

Site: BioReactor 1 Inf

Collection Date: 26-Nov-13 11:40 AM

Sample #: 2013028763

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	7.9	mg-N/L		0.25	25	EPA 353.2	12/05/2013 13:59	TLINN
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	194	mg/L		0.5	10	EPA 200.7	12/04/2013 11:00	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/10/2013 13:44	DJSULL1
Selenium (Se)	68.8	ug/L		10	10	EPA 200.8	12/10/2013 13:44	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Nickel (Ni)	20.9	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Selenium (Se)	70.9	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:48	DJSULL1

SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)

Vendor Parameter	Complete	Vendor Method	V_AS&C
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Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110456**

Site: BioReactor 2 Inf

Collection Date: 26-Nov-13 11:45 AM

Sample #: 2013028764

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	202	mg/L		0.5	10	EPA 200.7	12/04/2013 11:04	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Nickel (Ni)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Selenium (Se)	15.2	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	12/09/2013 11:52	DJSULL1

Site: Filter Blk

Collection Date: 26-Nov-13 12:00 PM

Sample #: 2013028766

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	12/10/2013 13:23	DJSULL1

Site: TRIP BLANK

Collection Date: 22-Nov-13

Sample #: 2013028767

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	12/04/2013 10:43	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Copper (Cu)	5.51	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	12/09/2013 12:33	DJSULL1



**APPLIED SPECIATION
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

December 17, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel) (LIMS# J13110456)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury, selenium speciation, and arsenic speciation analyses on December 3, 2013. The samples were received in a sealed cooler at 2.7°C on December 4, 2013. Selenium speciation and arsenic speciation analyses were performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeremy Maute".

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel) (LIMS# J13110456)

December 17, 2013

1. Sample Reception

Three (3) aqueous samples were submitted for selenium speciation and arsenic speciation analyses on December 3, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on December 4, 2013 in a sealed container at 2.7°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

An aliquot of each sample submitted for arsenic speciation analysis was filtered (0.45µm) into a polypropylene centrifuge tube; all filtrates and original bottles were then stored in a secure, monitored refrigerator (maintained at a temperature of ≤6°C) until the analyses could be performed.

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

Arsenic Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on December 5, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on December 12, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7)

gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

Arsenic Speciation Analysis by IC-ICP-CRC-MS Each sample was analyzed for arsenic speciation via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on December 9, 2013. Aliquots of each sample are injected onto an anion exchange column and eluted isocratically. The eluting arsenic species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a specific collision gas. Polyatomic interferences, due to their inherently larger size, collide more frequently with the collision gas and therefore may be separated from the analyte of interest via kinetic energy discrimination (KED). A solid-state detector detects ions transmitted through the mass analyzer on the basis of their mass-to-charge ratio (m/z), and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. With the exceptions noted below, all quality control parameters associated with these samples were within acceptance limits.

The selenocyanate matrix spike and matrix spike duplicate (MS/MSD) recoveries were below the lower control limit of 75% (44.9% and 46.0%, respectively). The spiking solution also contained selenite, and the spike recoveries for selenite were above the upper control limit of 125% (158.1% and 157.1%, respectively). The low recoveries for selenocyanate correlate with the elevated recoveries of selenite, suggesting that the sample matrix induces species conversion. No species conversion was observed in the bracketing continuing calibration verification standards (CCVs), demonstrating that the applied method stabilizes these species in solution. Since the low recoveries observed for selenocyanate in the MS and MSD are therefore attributable to the sample matrix, no corrective actions were required. The reported results are deemed representative of the supplied samples and indicate that the spiked sample matrix is oxidizing in nature.

All arsenic speciation results were corrected for instrument drift in accordance with the continuing calibration verification standards. All associated quality control parameters were within acceptance limits signifying that the applied calculations were appropriate.

The relative percent difference value for the dimethylarsinic acid matrix duplicate pair was greater than the control limit of 25%, at 34.8%. All associated dimethylarsinic acid results were near ten times the estimated method detection limit (eMDL). Results in this range exhibit a greater amount of variability. The calculated difference between the results was less than ten times the eMDL. No corrective action was necessary.

The estimated method detection limit (eMDL) for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

The eMDL values for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL values for arsenite, arsenate, and dimethylarsinic acid are generated using the standard deviation of replicate analyses of the lowest standard in the calibration curve. The eMDL for monomethylarsonic acid has been calculated using the average eMDL of arsenite, arsenate, and dimethylarsinic acid. The calibration does not contain monomethylarsonic acid due to impurities in the standard which would bias the results for other arsenic species.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Maute', with a stylized flourish at the end.

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	88.4	44.9	ND (< 3.5)	5.2	ND (< 3.0)	0 (0)
BioReactor 1 Inf	0.217	22.3	35.5	ND (< 0.86)	1.11	ND (< 0.76)	0 (0)
BioReactor 2 Inf	0.0330	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0047	ND (< 0.82)	ND (< 0.60)	ND (< 0.86)	ND (< 0.76)	ND (< 0.76)	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Sample Results

Sample ID	As(III)	As(V)	MMAs	DMAs	Unknown As Species
FGD Purge Eff	0.34	1.96	ND (< 0.11)	0.165	0.46
BioReactor 1 Inf	ND (< 0.18)	0.68	ND (< 0.11)	ND (< 0.033)	0.45
BioReactor 2 Inf	NR	NR	NR	NR	NR
BioReactor 2 Eff	ND (< 0.18)	0.53	ND (< 0.11)	0.274	0.24

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

MMAs = monomethylarsonic acid

DMAs = dimethylarsinic acid

Unknown As Species = Total concentration of all unknown As species observed by IC-ICP-MS

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 25x	eMDL 250x	eMDL 1000x
Hg	-0.0003	-0.0003	-0.0007	-0.0003	-0.0004	0.0002	0.0001	0.0006		-	-
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-	-	0.82	3.3
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	-	0.60	2.4
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-	-	0.86	3.5
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-	-	0.76	3.0
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-	-	0.76	3.0
As(III)	0.00	0.00	0.00	0.00	0.00	0.00	0.007	-	0.18	-	-
As(V)	0.00	0.00	0.00	0.00	0.00	0.00	0.005	-	0.13	-	-
MMAs	0.00	0.00	0.00	0.00	0.00	0.00	0.005	-	0.11	-	-
DMAs	0.00	0.00	0.00	0.00	0.00	0.00	0.001	-	0.033	-	-

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1655	105.5
Se(IV)	LCS	4.79	4.77	99.7
Se(VI)	LCS	4.74	4.59	96.7
SeCN	LCS	4.46	4.53	101.5
MeSe(IV)	LCS	3.24	3.02	93.3
SeMe	LCS	4.66	4.44	95.2
As(III)	LCS	5.000	5.739	114.8
As(V)	LCS	5.000	4.983	99.7
MMAs	LCS	4.610	4.841	105.0
DMAs	LCS	3.625	3.254	89.8

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.0065	0.0065	0.0065	0.0
Se(IV)	BioReactor 1 Inf	22.29	20.68	21.49	7.5
Se(VI)	BioReactor 1 Inf	35.54	36.30	35.92	2.1
SeCN	BioReactor 1 Inf	ND (< 0.86)	ND (< 0.86)	NC	NC
MeSe(IV)	BioReactor 1 Inf	1.11	0.95	1.03	16.3
SeMe	BioReactor 1 Inf	ND (< 0.76)	ND (< 0.76)	NC	NC
As(III)	BioReactor 2 Eff	ND (< 0.18)	ND (< 0.18)	NC	NC
As(V)	BioReactor 2 Eff	0.53	0.48	0.50	10.5
MMAs	BioReactor 2 Eff	ND (< 0.11)	ND (< 0.11)	NC	NC
DMAs	BioReactor 2 Eff	0.27	0.39	0.33	34.8*

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

*Associated results were near ten times the eMDL. Difference was less than ten times the eMDL.

Total Mercury, Selenium Speciation, and Arsenic Speciation Results for Duke Energy

Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13110456

Date: December 17, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.138	106.6	2.000	2.222	110.8	3.9
Se(IV)	BioReactor 1 Inf	1390	2218	158.1*	1390	2205	157.1*	0.6
Se(VI)	BioReactor 1 Inf	1261	1363	105.2	1261	1372	106.0	0.7
SeCN	BioReactor 1 Inf	1144	513.2	44.9*	1144	525.7	46.0*	2.4
As(III)	BioReactor 2 Eff	50.00	48.08	96.2	50.00	47.08	94.2	2.1
As(V)	BioReactor 2 Eff	50.00	51.06	101.1	50.00	49.59	98.2	2.9
DMAs	BioReactor 2 Eff	52.45	54.87	104.0	52.45	52.36	99.2	4.7

*Low/high recovery is due to matrix induced species conversion. Please see narrative.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER# 313112456	MATRIX: OTHER	Samples Originating From NC _____ SC _____
Logged By Jm	Date & Time 11/22/13 1155	SAMPLE PROGRAM Water _____ Ground NPDES _____ Drinking Water UST _____ RCRA Waste _____
AS&C PO #650910		Cooler Temp (C) 15 Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None

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¹⁹Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

1) Project Name Belews - FGD WWTS (Bi-Monthly & Flex Fuel)	2) Phone No:
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman	Use Project: WWTS FGD-Routine 2013
5) Business Unit: 20003	6) Process: BMCEFGD Mail Code:
8) Oper. Unit: BC00	9) Res. Type: 10) Reso. Center:

Customer to complete all
appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

LAB USE ONLY		Se Speciation Bottle ID	¹³ Sample Description or ID	Date	Time	Signature	¹⁷ Comp.	¹⁸ Grab	TDS	Br (Dionex)	Metals* + Hg 245.1**	As and Se (IMS), filter	NO3-NO2	Hg 200.8 (V_AS&C)	As and Se speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
¹¹ Lab ID															
20302 8761			FGD Purge Eff	11/26	1130	TO				1	1	1	1		1
20302 8762			EQ Tank Eff.	11/26	1135	TO					1	1			
20302 8763			BioReactor 1 Inf	11/26	1140	TO					1**	1	1	1	1
20302 8764			BioReactor 2 Inf	11/26	1145	TO					1**			1	
20302 8765			BioReactor 2 Eff	11/26	1150	TO			1	1	1**		1	1	1
20302 8766			Filter Blk	11/26	1200	TO						1			
20302 8767			Metals Trip Blk	11/22							1**				
Filtering of the Se is performed in the field please provide a filter blank too.															

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By <i>Matt Campbell</i>	Date/Time 11/26/13 1410	2) Accepted By <i>[Signature]</i>	Date/Time 11/27/13 1145	Customer, IMPORTANT! Please indicate desired turnaround.	²² Requested Turnaround 21 Days _____ *7 Days _____ *48 Hr _____ *Other _____ * Add. Cost Will Apply
3) Relinquished By <i>[Signature]</i>	Date/Time 12/3/13 1310	4) Accepted By <i>[Signature]</i>	Date/Time FEDEX		
5) Relinquished By	Date/Time	6) Accepted By:	Date/Time		
7) Relinquished By	Date/Time	8) Accepted By:	Date/Time		
9) Seal/Locked By	Date/Time	10) Seal/Lock Opened By	Date/Time		
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time		
Comments					

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg